

RECEIVED

NOV 19 1996

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)
)
Allocation of Spectrum Below) ET Docket No. 94-32
5 GHz Transferred From)
Federal Government Use)

To: The Commission

DOCKET FILE COPY ORIGINAL

PETITION OF
THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED
FOR ISSUANCE OF FURTHER NOTICE OF PROPOSED RULE MAKING

The American Radio Relay
League, Incorporated
225 Main Street
Newington, CT 06111

Christopher D. Imlay
BOOTH FRERET IMLAY & TEPPER, P.C.
1233 20th Street, N. W.
Suite 204
Washington, D. C. 20036
(202) 296-9100

November 19, 1996

0714

TABLE OF CONTENTS

	<u>Page</u>
Summary	i
I. Background.	2
II. The Omnibus Budget Reconciliation Act	4
III. Omnibus Consolidated Appropriations Act	6
IV. The Primary Allocation for Amateurs at 2300-2305 MHz	8
Appendix	
Exhibit A - Bandplan	
Exhibit B - Spectrum Reallocation Final Report (Appendix B only)	

SUMMARY

The American Radio Relay League, Incorporated (the League), the national association of amateur radio operators in the United States, requests the issuance of a Third Notice of Proposed Rule Making in the captioned proceeding, looking toward the amendment of Section 2.106 of the Commission's rules with respect to the creation of a primary domestic allocation for the Amateur Radio Service in the 2300-2305 MHz band, and associated amendments to the Part 97 regulations governing the Amateur Service.

RECEIVED

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

NOV 19 1996

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

In the Matter of)
)
Allocation of Spectrum Below) ET Docket No. 94-32
5 GHz Transferred From)
Federal Government Use)

To: The Commission

**PETITION OF THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED
FOR ISSUANCE OF FURTHER NOTICE OF PROPOSED RULE MAKING**

The American Radio Relay League, Incorporated (the League), the national association of amateur radio operators in the United States, by counsel and pursuant to Section 1.401 of the Commission's Rules, hereby respectfully submits its request for issuance of a Third Notice of Proposed Rule Making¹ in the captioned proceeding, looking toward the amendment of Section 2.106 of the Commission's rules with respect to the creation of a primary domestic allocation for the Amateur Radio Service in the 2300-2305 MHz band, and associated amendments to the Part 97 regulations

¹ As will be seen herein, the League requests the issuance of a Third Notice of Proposed Rule Making in the captioned proceeding. The procedural means of achieving the relief requested was determined by the Commission's stated intent in the *Plan for Reallocated Spectrum* (FCC 96-125, *infra*, at paragraph 65), to consider "Group 2" frequency bands in further rulemaking, presumably in this proceeding. The "Group 2" bands include the 2300-2310 MHz band. However, a procedural alternative available to the Commission, which may be more expeditious, would be to consider this matter in any Report and Order issued in General Docket 96-228, which deals with the 2305-2320 MHz and 2345-2360 MHz bands. The League would accede to either procedural vehicle for affording the relief requested herein.

governing the Amateur Service. As good cause therefor, the League states as follows:

I. Background

1. The allocation history and current status of the 2300-2310 MHz band, and its availability and use by the Amateur Service, are reasonably well summarized in the Commission's *Plan for Reallocated Spectrum*, FCC 96-125, released March 22, 1996, at paragraphs 41-45. However, in evaluating the history of amateur allocations at 2 GHz, and the extent to which that allocation has been steadily eroded, it is necessary to view a larger segment of that spectrum, rather than examining only the 2300-2310 MHz band.

2. Until approximately ten years ago, the Amateur Service had secondary access domestically to the entire 2300-2450 MHz band. Indeed, this band is allocated on a worldwide basis to the Fixed services on a primary basis. In Regions 2 and 3, the co-primary allocations are for fixed, mobile and radiolocation. The Amateur Service is secondary in the entire 2300-2450 MHz band in all three regions, subject to certain footnotes to the Table of Allocations.² In the United States, the 2400-2483.5 MHz segment is available for Industrial, Scientific and Medical devices operating pursuant to

² See footnotes 664, 750B, 751, 751B, and 752. These establish, among other things, that use of the 2310-2390 MHz band for aeronautical mobile telemetry has priority over other mobile uses; that 2310-2360 MHz is allocated for BSS (sound) and complimentary terrestrial broadcasting on a primary basis in the United States; and that international coordination of BSS (sound) and terrestrial broadcast use is required.

U.S. Footnote 253, however, states that "*In the band 2300-2310 MHz, the fixed and mobile services shall not cause harmful interference to the amateur service*".

Part 18 of the Commission's rules. The domestic allocation for amateurs at 2300-2450 MHz provided essentially unlimited use of the 2300-2400 MHz band, due to the relatively light use by Government Radiolocation, away from populated areas. Most amateur operation below 2400 MHz, however, has historically concentrated most densely around 2304 MHz. The portion of the band above 2400 MHz has been used for amateur television and satellite operation. A copy of the 1991 ARRL bandplan is attached hereto as Exhibit "A" for reference.

3. The Amateur Service was excluded from the 2310-2390 MHz band domestically in 1984, in order to accommodate aeronautical flight test telemetry in that band in certain areas.³ Amateur use of the 2400-2450 MHz band has always been limited by Part 18 operation above 2400 MHz. An amateur primary allocation at 2390-2400 MHz was just created in this proceeding,⁴ a segment in which data-PCS will also be able to operate. The most useful segment for amateur weak-signal communications and propagation research, including beacon operation, is 2300-2310 MHz, because of the low noise levels in that band. Just below that band, at 2290-2300 MHz, NASA operates the Government Deep Space Network receiver, which requires protection from interference. Amateur operation above 2300 MHz is entirely compatible with the avoidance of interference to

³ See the *Second Report and Order*, General Docket 80-739, FCC 83-511, released December 8, 1983; and the *Report and Order*, FCC 84-446, 56 RR 2d 1413 (1984) in Docket 84-186.

⁴ See the *First Report and Order and Second Notice of Proposed Rule Making* in this proceeding, 10 FCC Rcd. 4769 (1995), which allocated the 2390-2400 MHz and 2402-2417 MHz bands on a primary basis to the Amateur Service.

the Deep Space Network and associated government operations below 2300 MHz. This is due not only to the fact that amateur activity at 2300-2310 MHz is currently centered at 2304 MHz, but also because of the traditionally cooperative relationship that exists between amateurs and the conductors of radioastronomy activities.

II. The Omnibus Budget Reconciliation Act

4. The Omnibus Budget Reconciliation Act of 1993, Pub. L. 103-66, 107 Stat. 312, enacted August 10, 1993, ("OBRA") ordered the NTIA⁵ to identify at least 200 MHz of spectrum, which was then allocated for use by Federal Government Agencies below 5 GHz, that could be transferred to private sector use. At least 100 MHz of this spectrum had to be below 3 GHz. See, 47 U.S.C. §923(e)(2)(A) and (B). In response to OBRA, NTIA in fact identified 235 MHz of spectrum to be reallocated, and among these was the 2300-2310 MHz band. OBRA instructed that, in identifying spectrum for transfer to non-Government use, the Secretary of Commerce must avoid "excessive disruption of existing use of Federal Government frequencies by amateur radio licensees". Furthermore, in identifying spectrum for reallocation and considering the possible non-Government uses of the bands identified, the Secretary of Commerce was to consider "the extent to which, in general, commercial users could share the frequency with amateur radio licensees."

⁵ NTIA would act through the Secretary of Commerce.

5. Both NTIA, in its *Spectrum Reallocation Final Report*⁶, which made available for private sector reallocation the 2300-2310 MHz band, and the Commission, in its *Plan for Reallocated Spectrum*, (*supra*), indicated significant doubt that commercial services could successfully share with amateurs at 2300-2310 MHz.⁷ Nonetheless,

⁶ U.S. Department of Commerce, NTIA Special Publication 95-32, February, 1995 (referenced herein as the "Final Report"). Appendix B of that document is attached hereto as "Exhibit B" for reference.

⁷ The Appendix B of the Final Report includes a basic analysis of amateur operation and the potential for non-government services to share with amateurs. The latter source, the FCC Reallocation Plan, bears extensive quotation:

Potential uses of this band were discussed in our recent proceeding to allocate spectrum transferred from Federal Government use, ET Docket No. 94-32, although action regarding this band was deferred (citation omitted). Comments filed in that proceeding describe current amateur service use of 2300-2310 MHz. The American Radio Relay League, as well as other commenters, report that this band is used for weak signal operation centered on or near 2304.1 MHz. Weak signal operations require the use of highly sensitive receivers and high powered transmitters. A channelling plan submitted by the Southern California Repeater and Remote Base Association shows weak signal operations from 2303.75-2304.75, with the remainder of the 2300-2310 MHz band being paired with the 2390-2400 MHz band for fixed microwave operations. As discussed in the background section of this plan, the Commission, in Docket 94-32, made primary the allocation for the amateur service at 2390-2400 MHz.

Sharing between Federal Government users and the amateur service has been successful largely because Federal operations are generally located outside of highly populated areas. (citation omitted). It is very unlikely that the Amateur Service will enjoy an analogous situation with a commercial or other private sector service. If commercial services are to share with the weak signal operations located at 2303.75-2304.75 MHz, they must be able to withstand potential interference from the high-powered transmitters used for those

the 2300-2310 MHz band was made available for non-government use in August of 1995. The Commission, in its *Plan for Reallocated Spectrum*, grouped the reallocated bands in terms of scheduled public access thereto. It grouped all the reallocated bands which are amateur allocations into "Group 2", which is the largest group, containing 70 MHz. It also contains, according to the Commission's *Plan for Reallocated Spectrum*, the most currently "encumbered" bands. The Plan states that the Commission intends to initiate rulemakings to allocate these bands in 1996, as the Group 2 bands are immediately available.

III. Omnibus Consolidated Appropriations Act

6. The Commission's plan for rulemaking to determine the allocation of the 2300-2310 MHz band, however, and the utility of amateur use of half of the band, was swiftly altered by the passage, on October 4, 1996, of Public Law 104-208, the Omnibus Consolidated Appropriations Act, for FY 1997. That legislation, in part, ordered the Commission to auction the 2305-2320 MHz, and 2345-2360 MHz bands to wireless services, and to assign the use of those frequencies by competitive bidding. The auctions are to be

operations, but not create interference to the sensitive receivers used. This is something of a contradiction that tends to point to relatively low powered devices that operate over short distances, such as devices authorized under Part 15 of the Commission's Rules, or to operations with a lower density of use that may be located in relatively remote areas. Similar operations should also be compatible with amateur service fixed operations, as would commercial fixed operations that can be coordinated with amateur systems.

FCC *Plan for Reallocated Spectrum*, *Id.*, at 26.

completed by April 15, 1997. The Commission has just issued a *Notice of Proposed Rule Making*, FCC 96-441, in General Docket 96-228, released November 12, 1996, which does not propose to alter the domestic allocation table with respect to the use by amateurs of the 2305-2310 MHz segment, but it does indicate an intention to consider comments concerning the continuation of amateur operation in the band. Paragraph 8 of that Notice states as follows:

As mentioned above, the 2300-2310 MHz band is currently allocated to the amateur radio service on a secondary basis. In addition, the 2310-2360 MHz band is permitted to be used by aeronautical telemetry operations on a secondary basis. We do not propose any changes to these allocations at this time. We reiterate, however, that these operations would be secondary to any WCS (Wireless Communications Service) use of the 2305-2320 and 2345-2360 MHz bands. We seek comment on this approach.

Thus, while the Commission intends to preserve the secondary allocation for amateurs, the amorphous nature of the proposed new WCS, which will include "a broad range of fixed, mobile, radiolocation and broadcasting-satellite services" according to the Notice, will make amateur secondary use of the 2305-2310 MHz segment highly problematic. As was determined by NTIA in the *Final Report* and the Commission in the *Plan for Reallocated Spectrum*, amateur sharing with commercial mobile services, especially those in highly populated areas is difficult. In any event, the auction of commercial licenses in the 2305-2310 MHz band most certainly will, in effect, diminish the utility of amateur secondary use thereof. Neither the recent legislation, however, nor the Commission's new Notice in Docket 96-228, address the 2300-2305 MHz band.

IV. A Primary Allocation for Amateurs at 2300-2305 MHz

7. Because of the intervention of the Omnibus Consolidated Appropriations Act, the Commission's planned rulemaking with respect to the 2300-2310 MHz band has been effectively preempted. What is left for consideration, since the disposition of the 2305-2310 MHz band has been dictated by Congress in an unprecedented manner, are the details of the auction of the 2305-2310 MHz band, which are being addressed by the Notice in Docket 96-228, and the allocation of the 2300-2305 MHz segment. The latter is ideally suited for domestic Primary allocation to the Amateur Service. Amateurs make significant use of the 2300-2305 MHz segment, for numerous types of communications. Reference to the League's Band Plan for the entire 2300-2310 MHz band (Exhibit "A") reveals the wealth of uses that are made of that segment, some of which will no longer be able to be conducted in the 2305-2310 MHz segment following the 1997 auctions for commercial licenses in that band. The partial disaccommodation that will occur from the forced sharing with high-duty-cycle commercial users at 2305-2310 MHz will require significant compression of amateur uses at 2300-2305 MHz. Those are the types of uses that require protection from interference. As can be seen from Exhibit B, attached, the Amateur Service is uniquely capable of protecting the space research efforts below 2300 MHz. At the same time, amateurs currently make good use of the low-noise environment for weak-signal communications at and around 2304 MHz, which is uniquely suited for that purpose. It can also make extensive use of the remainder of

the segment for point-to-point links, paired with frequencies in the 2390-2400 MHz band. What it cannot do easily, however, is to conduct certain types of communications in the high-noise, high-duty-cycle environment that will be created by the new WCS above 2305 MHz. Those displaced types of communications will require the interference protection and stability afforded by a primary allocation at 2300-2305 MHz.

8. It is not sufficient to continue the secondary amateur allocation at 2300-2305 MHz. The commercial operations incoming above 2305 MHz necessitate some stability in the planning of the 2300-2305 MHz segment by amateurs to reaccommodate certain uses, and the necessary arrangements to provide absolute protection for Government Deep-Space Research operation at 2290-2300 MHz. Neither are the uses made by amateurs at 2300-2305 MHz, including Earth-moon-Earth operation, terrestrial weak-signal operation, and propagation beacon monitoring, accommodated without some protection of the sensitive receivers employed. The League would accept and accommodate footnotes imposing necessary interference protection constraints on amateur operation relative to the NASA Deep-space network and Planetary Radar operations at Goldstone, CA or elsewhere, but amateurs need and should be afforded protection from uses within the 2300-2305 MHz band. It is also requested that the Commission not introduce any other use in the band, in view of the necessity to protect the extant and expanding amateur uses in the band which involve sensitive receivers. It is also necessary to maintain flexibility in the amateur uses of the 2300-2305 MHz band,

so that some paired, point-to-point operation can be conducted, together with frequencies in the 2390-2400 MHz band.

Therefore, the foregoing considered, the American Radio Relay League, Incorporated requests that the Commission issue a Further Notice of Proposed Rule Making in this proceeding at an early date, (or a Report and Order in General Docket 96-228) to amend the Table of Frequency Allocations, (47 C.F.R. §2.106), to elevate the Amateur Service allocation at 2300-2305 MHz band to primary domestically, and amending accordingly the Amateur Service Rules (47 C.F.R. Part 97) to accommodate the revised domestic allocation table, all in accordance with the attached Appendix.

Respectfully submitted,

**THE AMERICAN RADIO RELAY
LEAGUE, INCORPORATED**

225 Main Street
Newington, CT 06111

By


Christopher D. Imlay
General Counsel

BOOTH, FRERET, IMLAY & TEPPER, P.C.
1233 20th Street, N. W.
Suite 204
Washington, D. C. 20036
(202) 296-9100

November 19, 1996

APPENDIX

1. The Table of Frequency Allocations, 47 C.F.R. §2.106, is amended to read as follows:

United States			
MHz	Government Allocation	Non-Government Allocation	Remarks
2300-2305		AMATEUR	Part 97
	G123		
2305-2310	G123	FIXED MOBILE RADIOLOCATION BROADCASTING- SATELLITE Amateur US253	Part 27

2. Title 47, C.F.R. §97.301(a) is amended to read as follows:

Wavelength band	*****			Sharing requirements See §97.303, para:
	ITU Region 1	ITU Region 2	ITU Region 3	
13 cm	2300-2310	2300-2310	2300-2310	(a), (j)

3. Title 47, C.F.R. §97.303(j)(2) is amended to read as follows:

(j) In the 13 cm band:

(2) In the United States, the 2300-2305 MHz segment is allocated to the amateur service on a primary basis. The 2300-2310 MHz band is allocated on a secondary basis to the Wireless Communications Service (WCS); in this segment, the fixed, mobile, radiolocation and broadcasting-satellite services are primary. However, the fixed and mobile services must not cause harmful interference to the amateur

service. No amateur station transmitting in the 2400-2450 MHz segment is protected from interference due to the operation of industrial, scientific and medical devices on 2450 MHz.

EXHIBIT A

EXHIBIT A

FCC Part 97 Privileges

License Class	Terrestrial location of the amateur radio station			
	Region 1 MHz	Region 2 MHz	Region 3 MHz	Limitations*
Technician	2300-2310	2300-2310	2300-2310	
General	2390-2450	2390-2450	2390-2450	
Advanced				
Extra				

*See §§97.301-307 of the FCC rules for further details on authorized privileges for each license class, frequency sharing requirements and authorized modes.

Amateur Radio Band Plans

Region 1 MHz	Region 2 MHz	Region 3 MHz	ARRL* MHz
			2300.0-2303.0 High-rate data (transmission rate \geq 4800 bauds, duplex)
			2303.0-2303.5 Packet (transmission rate \leq 2400 bauds, channel spacing = 25 kHz)
			2303.5-2303.8 TTY, packet (transmission rate \leq 2400 bauds, bandwidth \leq 2.5 kHz)
			2303.8-2303.9 Packet (bandwidth \leq 2.5 kHz), TTY, CW, EME
			2303.9-2304.1 CW, EME
			2304.1-2304.2 CW, EME, SSB
			2304.2-2304.3 SSB, SSTV, fax, packet (bandwidth \leq 2.5 kHz), AM, AMTOR
			2304.30-2304.32 Propagation beacon network
			2304.32-2304.40 General propagation beacons
			2304.400 Calling frequency
			2304.4-2304.5 SSB, SSTV, ACSSB, fax, packet (bandwidth \leq 2.5 kHz), AM, AMTOR, experimental (bandwidth \leq 2.5 kHz)
			2304.5-2304.7 Crossband linear translator input
			2304.7-2304.9 Crossband linear translator output
			2304.9-2305.0 Experimental beacons
			2305.0-2305.2 FM simplex (channel spacing = 25 kHz)
			2305.200 FM simplex calling frequency
			2305.2-2306.0 FM simplex (channel spacing = 25 kHz)
			2306.0-2309.0 FM repeaters (channel spacing = 25 kHz, input)
			2309.0-2310.0 Control and auxiliary links
			2390.0-2396.0 Fast-scan television
			2396.0-2399.0 High-rate data (transmission rate \geq 4800 bauds, duplex)
			2399.0-2399.5 Packet (transmission rate \leq 2400 bauds, channel spacing = 25 kHz)
			2399.5-2400.0 Control and auxiliary links
			2400.0-2403.0 Satellite
			2403.0-2408.0 Satellite, high-rate data (transmission rate \geq 4800 bauds, duplex)
			2408.0-2410.0 Satellite
			2410.0-2413.0 FM repeaters (channel spacing = 25 kHz, output)
			2413.0-2418.0 High-rate data (transmission rate \geq 4800 bauds, duplex)
			2418.0-2430.0 Fast-scan television
			2430.0-2433.0 Satellite
			2433.0-2438.0 Satellite, high-rate data (transmission rate \geq 4800 bauds, duplex)
			2438.0-2450.0 Wide-band FM, fast-scan television, FM television, spread spectrum, experimental

*This band plan for 2300-2310 and 2390-2450 MHz was adopted by the Board of Directors at its January 1991 meeting. See Minute 56.

EXHIBIT B

APPENDIX B AMATEUR SHARING STUDY

INTRODUCTION

The preliminary reallocation plan identified the 2300-2310, 2390-2400, and 2402-2417 MHz bands as part of the 200 MHz to be reallocated to the FCC for non-Federal use. These bands are allocated to the amateur and amateur-satellite services on a secondary basis. Based on the public comments, subdividing the 2400-2450 MHz band into three parts, as proposed in the Preliminary Report, would not meet the needs of the principal users of the band. However, reallocating the entire 2400-2450 MHz band would give the FCC greater flexibility in developing a comprehensive plan to address the spectrum needs of the amateurs as well as the other users of the band. Therefore, the 2400-2402 and 2417-2450 MHz band segments will be included in the final reallocation plan for mixed Federal and non-Federal use.

Though NTIA's proposed reallocation to the FCC for non-Federal use does not in itself deny these frequencies to the amateur radio services, the amateur radio community believes these actions set the stage for the amateur services having limited access in the reallocated bands. Title VI requires that the Secretary of Commerce determine the extent to which, in general, the private sector can share the frequencies to be reallocated with the incumbent amateur radio licensees.¹ This requirement presupposes that NTIA knows the specific types of potential commercial and public-safety applications intended by the FCC for the reallocated spectrum, or at least the range of possible uses. Until candidate radio services are selected or at least identified, it is difficult for NTIA to conduct the mandatory sharing study required by Congress in Title VI. The only practical means for the Secretary to discharge NTIA's statutory obligation is to conduct a general sharing study based on information about present and near-term future amateur uses of the segments proposed for reallocation, and a range of possible commercial and public-safety applications.

AMATEUR BAND USAGE

The 2300-2450 MHz band comprises part of the spectrum known in the amateur community as the 13 cm band. The amateur allocation at 13 cm is currently split into two parts: 2300-2310 MHz and 2390-2450 MHz. A band plan outlining the structure of amateur spectrum uses and needs for the 2300-2450 MHz band is given in Figure B-1.² As indicated in the Figure B-1, the amateur radio community intends to develop the 2300-2450 MHz band for the following uses: weak-signal experimentation, narrowband and wideband point-to-point linking, satellite activities, and amateur television transmission.

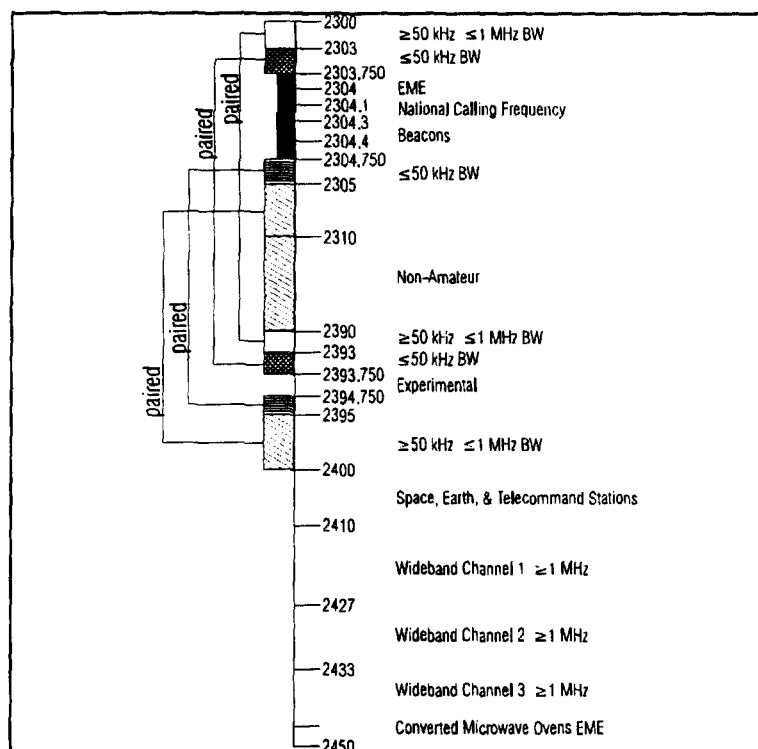


Figure B-1. 2300-2450 MHz Amateur Band Plan.

SHARING WITH AMATEUR OPERATIONS

The amateur radio service has successfully co-existed with Federal fixed, mobile and radiolocation services (i.e., radar) for nearly fifty years.³ As indicated in many of the public comments on the Preliminary Report and the FCC NOI, this sharing arrangement has been successful for both Federal and amateur spectrum users. This success is primarily due to the fact that much of the Federal spectrum usage is located away from populated areas, minimizing potential interference as well as the amateur's ability to utilize the guard bands placed between different types of Federal services.⁴ In addition to the Federal Government, the amateur radio service shares the 2400-2450 MHz segment with non-licensed devices and Industrial, Scientific, and Medical (ISM) devices. Recently, amateurs have indicated that there are practical problems sharing spectrum with commercial services that have a relatively high transmitter power, a high number of stations in heavily populated areas, and/or high duty cycle.⁵ The following paragraphs will examine in general the sharing possibilities for each of the four amateur radio operations that could be potentially impacted by the spectrum reallocation.

Weak-Signal Operations

Currently most amateur weak-signal operations take place at or near 2304 MHz. The comments submitted by representatives of the amateur radio service on the Preliminary Report indicate that the spectrum from 2448-2450 MHz is also of interest to amateurs involved in weak-signal operations.⁶ Amateurs are engaged primarily in employing weak-signal techniques for extended range communications.^a Weak-signal stations typically employ sensitive narrow bandwidth receivers (3 kHz or less), high transmitter power, and highly directional antennas. Most of the time the highly directional antennas are pointed well above the horizon.⁷ Based on these operational constraints the amateurs indicate that weak-signal stations could co-exist with certain commercial or public-safety terrestrial operations. The receivers used in weak-signal communications are sensitive and cannot operate in a high-noise environment; therefore, sharing with a high-power, high-density commercial application is considered impractical.⁸ Commercial satellite applications are also likely to conflict with typical weak-signal operations. The amateurs feel that satellite uplinks would be a problem since as a satellite transponder travels over the horizon, it could be easily saturated by the high-power signal emitted from a weak-signal transmitter.⁹ Satellite downlinks are also seen as potential problems because of the sensitivity of the weak-signal receivers

Television Operations

As shown in Figure B-1, amateur television (ATV) will occupy three channels: 2410-2427, 2427-2433, and 2433-2450 MHz. The concern expressed by the amateur community is that a loss of spectrum at the lower portion of the 2400 MHz band would force other displaced amateur operations into the ATV channels.¹⁰ With ATV likely to evolve to a digitally compressed format, it will have a better chance to co-exist in a high interference environment.¹¹ In addition, the rapidly expanding use of digital compression at reasonable costs may lessen the need of 40 MHz for ATV operations. However, the amateur commenters feel that if the spectrum is reallocated for commercial applications with a high duty

^a Amateur weak-signal stations communicate by many propagation methods such as tropospheric ducting and scatter; low atmospheric inversion ducting; refraction and reflection off natural objects (i.e., mountains); and EME (moonbounce), to name a few.

cycle, the band would be rendered virtually unusable for ATV.¹² Currently ATV operates in the presence of ISM and spread spectrum non-licensed devices. Most ATV operations are expected to occur in residential areas, or proximate to residential areas, with current uses primarily in metropolitan areas near cities and suburbs. The simplest type of commercial use to accommodate in these allocations would be licensed terrestrial point-to-point stations, or services not routinely located proximate to residential areas. Commercial or public-safety applications with low duty cycles would be more likely to avoid interference to and from ATV operations in the same band, and digital operation would be preferred over analog technologies. Wide bandwidth and spread spectrum uses are particularly suitable to sharing with ATV operations.¹³

Point-to-Point Operations

Point-to-point amateur operations involve paired frequencies with spacing from 40 MHz to 150 MHz. This is accomplished by using portions of the 2300-2310 MHz and the 2390-2400 MHz bands. Two bands are required because transmission and reception from one site simultaneously normally involves using different frequencies to increase isolation between the transmitter and receiver. Amateur point-to-point applications use high-performance receivers to ensure good path reliability. These receivers are protected by filters sufficient to reject their own transmitter operating on the same antenna. These filters are more than sufficient to reject near-band or out-of-band interference of any normal magnitude.¹⁴ The amateur fixed point-to-point services may effectively use the same spectrum as low-power spread spectrum or medium bandwidth digital commercial devices intended for localized uses.¹⁵ Several public-safety commenters to the FCC suggested that the 2390-2400 MHz band would be particularly suitable for the advanced private mobile communications technologies described in the COPE Petition, including private fixed service microwave operations at remote site locations.¹⁶ Electronic Toll and Traffic Management (ETTM) systems could possibly share with amateur point-to-point operations. ETTM systems are low-power, low duty cycle devices employing directional antennas.¹⁷ In general these systems will be used on highways away from residential areas where interference problems could be handled on a case-by-case basis. The amateurs also feel that high-power wide-area operations should be restricted in favor of more localized commercial and public-safety applications.¹⁸

Satellite Operations

Amateur-satellite downlink operations are planned for the 2400-2410 MHz portion of the 2300-2450 MHz band as shown in Figure B-1. However, all current and near future amateur-satellite usage can be accommodated in the 2400-2402 MHz band segment. TABLE B-1 gives a list of the amateur-satellite operations in the 2400 MHz band.¹⁹ The amateur-satellite community is planning to increase its use of 2400-2402 MHz to include uplinks on the next generation of satellites. Amateur-satellite operations employ a relatively weak signal and often use high-power

TABLE B-1
Amateur-Satellite Usage in the 2400 MHz Band

Amateur-Satellite	Band (MHz)
AMSAT-OSCAR 13	2400.711-2400.747 & 2400.650
UOSAT-OSCAR 11	2401.5
PACSAT (AO-16)	2401.1
Dove (DO-17)	2401.22
Phase 3D	2400.500-2400.900 & 2400.100-2400.500

terrestrial transmitters. This poses interference potential to adjacent operations and those operations pose potential interference to the terrestrial satellite receivers (most commonly through excessive sideband noise). The amateurs feel that any adjacent operations should be limited to an assigned occupied bandwidth of 50 to 100 kHz to minimize sideband noise. The amateurs contend that this bandwidth limitation for commercial and public-safety systems will also encourage the use of filtering on the adjacent systems receivers which will aid in protecting them from high-power satellite (terrestrial) transmitters.²⁰ In evaluating the feasibility of frequency sharing with the amateur-satellite service, it is important to realize two distinct types of satellites are employed in this service. One is the high-altitude, elliptical orbit type of satellite. The other, more numerous type is the low-earth-orbit (LEO) satellite, generally in circular orbits below 1000 kilometers in altitude. During approximately half the time in which an amateur LEO satellite is within range of an earth station, it is less than 10 degrees above the horizon. Thus, unlike commercial services using geostationary spacecraft, the elevation angle of amateur earth stations is unlikely to provide much, if any, relief from interference from and to terrestrial services.²¹ Spread spectrum local area networks can effectively share with amateur-satellite operations, because satellite receivers are generally not collocated with those type of devices.²² The amateur-satellite community as a whole is concerned about sharing spectrum with high-density mobile commercial services. The general consensus among amateur commenters is that it would be far less difficult to share with point-to-point microwave links since the chances of interference would be relatively slight and could be dealt with on a case-by-case basis.²³ Several public-safety organizations suggested that spectrum in the 2400-2450 MHz band could be used for private fixed microwave service operations in remote locations.²⁴ The amateurs also indicate that low-power, low duty cycle ETTM systems using directional antennas can also share with amateur-satellite operations.

SUMMARY

The importance of the 2300-2450 MHz band to the amateur radio service is principally in the near future. The sharing opportunities between amateurs and commercial services depend largely on the development of a sharing plan which will permit the orderly growth of the amateur users of the bands while at the same time supporting commercial and public-safety applications. The fundamental ability of the amateurs to continue operations in the reallocated bands is dependent largely on the characteristics of the commercial and public-safety applications that are to be added to the bands. TABLE B-2 provides an overview of the potential impact to current and future amateur operations and possible sharing options between the amateur service and commercial and public-safety applications.

TABLE B-2
Overview of Potential Impact to Amateur Operations and Sharing Options

Amateur Operation	Potential Impact	Sharing Options
Weak-Signal		
2304 MHz	Potentially impacted by spectrum reallocation; Protecting 0.5 MHz around 2304 MHz would eliminate impact.	Federal Government; Non-licensed device (Part 15) applications; Certain commercial terrestrial and public-safety applications.
2450 MHz	Not impacted by spectrum reallocation. ^a	
Amateur TV		
Current analog	1 of 3 channels potentially impacted; Conversion of one ATV channel from FM to AM would minimize impact.	Federal Government; Industrial, scientific, and medical (ISM) applications; Part 15 applications.
Future digital	Expected minimal impact; at least 11 compressed video channels, each 3 MHz wide, will be available.	Federal Government; ISM applications; Part 15 applications; Commercial spread spectrum applications; Commercial or public-safety applications; Low duty cycle applications.
Point-to-Point		
Current narrowband	Potentially impacted by spectrum reallocation.	Federal Government; ISM applications; Part 15 applications.
Future wideband	30% of available band potentially impacted.	Federal Government; ISM applications; Part 15 applications; Commercial and public-safety point-to-point applications; Low-power commercial or public-safety spread spectrum applications; Electronic Toll and Traffic Management (ETTM) systems.
Satellite		
Current generation	Not impacted by spectrum reallocation. ^a	Federal Government; ISM; Part 15 applications; Spread spectrum Local Area Networks; Commercial point-to-point applications; Public-safety microwave operations in rural areas; ETTM systems.
Next generation	Not impacted by spectrum reallocation. ^a	
Long-term	Expansion beyond 2 MHz potentially impacted.	

^a This assumes that the FCC will take amateur usage of the band into consideration when identifying additional services to be placed in this spectrum.

ENDNOTES

Requests for copies of references from Federal departments and agencies should be referred to the originating organization. Parts of the reference material may be exempt from public release.

1. 47 U.S.C. § 923(c)(3)(C) (Supp. V 1993).
2. Southern California Repeater and Remote Base Assoc. (SCRRBA) Comments, at 10 (May 10, 1994), filed in response to NAT'L TELECOMMUNICATIONS AND INFO. ADMIN. (NTIA), U.S. DEP'T OF COMMERCE, SPECIAL PUBLICATION 94-27, PRELIMINARY SPECTRUM REALLOCATION REPORT (Feb. 1994) [hereinafter NTIA PRELIMINARY REPORT and all comments cited refer to this report, unless otherwise stated].
3. SCRRBA Comments, *supra* note 2, at 7.
4. *Id.*; American Radio Relay League Comments, at 8 (Nov. 6, 1992), filed in response to NTIA Notice of Inquiry in ET Docket No 92053-2132, 57 Fed. Reg. 25,010 (June 12, 1992) [hereinafter NTIA NOI]; Northern Amateur Relay Council of California Comments, at 3 (June 15, 1994), filed in response to FCC Notice of Inquiry ET Docket No 94-32, FCC 94-97, 59 Fed. Reg. 6005 (May 4, 1994) [hereinafter FCC NOI].
5. SCRRBA Comments, *supra* note 2, at 7; Radio Amateur Satellite Corp. (AMSAT) Comments, at 4 (June 8, 1994), filed in response to FCC NOI, *supra* note 4.
6. San Bernardino Microwave Society Inc. Comments, at 3 (May 2, 1994).
7. Southern California Repeater and Remote Base Assoc. (SCRRBA) Comments, at 13 (June 15, 1994), filed in response to FCC NOI, *supra* note 4.
8. AMSAT Comments, *supra* note 5, at 4.
9. SCRRBA Comments, *supra* note 7, at 14.
10. Northern Amateur Relay Council of California Comments, at 2 (June 13, 1994), filed in response to FCC NOI, *supra* note 4.
11. Northern Amateur Relay Council of California Comments, *supra* note 10, at 2.
12. SCRRBA Comments, *supra* note 7, at 4.
13. American Radio Relay League Comments, at 14 (June 15, 1994), filed in response to FCC NOI, *supra* note 4.
14. SCRRBA Comments, *supra* note 7, at 14.
15. *Id.* at 11.
16. Coalition of Private Users of Emerging Multimedia Technologies (COPE) Comments, at 5 (June 15, 1994), filed in response to FCC NOI, *supra* note 4.
17. Florida Dep't of Transportation Comments, at 1 (May 10, 1994).
18. SCRRBA Comments, *supra* note 7, at 10.
19. AMSAT Comments, *supra* note 5, at 5.
20. SCRRBA Comments, *supra* note 7, at 10.
21. Radio Amateur Satellite Corp. (AMSAT) Reply Comments, at 7 (June 30, 1994), filed in response to FCC NOI, *supra* note 4.
22. AT&T Corp. Comments, at 2 (June 15, 1994), filed in response to FCC NOI, *supra* note 4.
23. AMSAT Comments, *supra* note 5, at 4.
24. COPE Comments, *supra* note 16, at 5.